

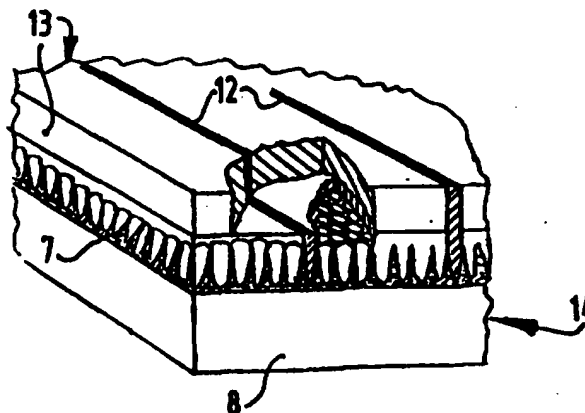
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(21) International Application Number: PCT/NL97/00071 (22) International Filing Date: 19 February 1997 (19.02.97) (30) Priority Data: 1002379 19 February 1996 (19.02.96) NL (71) Applicant (for all designated States except US): SALLMET-ALL B.V. [NL/NL]; Kanaaldijk O.Z. 3, NL-8102 HJ Raalte (NL). (72) Inventor; and (75) Inventor/Applicant (for US only): REINDERS, Johannes, Antonius, Maria [NL/NL]; Oude Warkenseweg 1, NL-7231 PE Wamsveld (NL). (74) Agent: SCHUMANN, Bernard, Herman, Johan; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Dutch).</i>

(54) Title: PRINTABLE FOIL**(57) Abstract**

A foil printable with ink comprises a porous layer which is penetrable to ink and ink-retaining, for instance an open fibrous layer of paper, in addition to a layer of material impermeable to ink, which layer closes off the porous layer and has penetrated into this layer over a certain distance via the pores present therein, which layer impermeable to ink is arranged on that (inner) side of the porous layer facing away from the (outer) side to which ink is supplied during a printing process.



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PRINTABLE FOIL

The invention relates to a foil printable with ink, comprising a porous layer which is penetrable to ink and ink-retaining, for instance an open fibrous layer of paper. Such a foil is known and can be for instance
5 printed with liquid ink using an ink-jet printer. During a printing process the porous layer receives ink on its side to be designated hereinafter as the outer side. This ink penetrates the porous layer inter alia by capillary action. This penetration can take place relatively rapid-
10 ly but it takes a relatively long time before the outer surface to which the ink is supplied has dried such that the thus printed foil can be covered by a transparent layer for adhering thereto, for instance of PET or PVC, which must be adhered thereto on the upper surface by
15 means of for instance pressure-sensitive glue, such as an acrylate.

It is generally the wish of users to make the colour intensity of prints as great as possible, which may very much enhance the clarity and brightness of the
20 images. It is necessary for this purpose to adjust an ink-jet printer such that it supplies relatively large quantities of ink per unit of surface area to the foil. This results in various drawbacks.

First of all, the effective drying period as
25 described above is even longer.

There is the further danger, particularly in the case of the relatively thin foils, that the foil will swell up locally and a more or less irregular wave shape thus results. Due to such a wave shape, at variance with
30 the optimum flat structure, the distances between the ink nozzles of the ink-jet printer and the foil will no longer be constant but begin to vary. The shapes of the regions to which ink is supplied by a nozzle will hereby

vary. It will be apparent that this has an adverse effect on the image quality.

A further drawback of the use of relatively large quantities of ink per unit of surface area lies in the fact that ink which has penetrated into the porous layer will spread laterally and exceed the nominal boundaries of a printing zone. This is referred to as "bleeding" and results in an essential blurring of sharp contours and intermingling of colours of adjacent printing zones.

The invention now provides a foil of the type stated in the preamble which is characterized by a layer of material impermeable to ink, which layer closes off the porous layer and has penetrated into this layer over a certain distance via the pores present therein, which layer impermeable to ink is arranged on that (inner) side of the porous layer facing away from the (outer) side to which ink is supplied during a printing process.

The layer impermeable to ink gives the porous layer an increased dimensional stability, whereby said bulging and waving is reduced to a considerable degree.

Owing to the fact that the layer impermeable to ink has penetrated some depth into the porous layer and thus closes off the pores present therein with a more or less irregular pattern, it has surprisingly been found in practice that the phenomenon designated as "bleeding" is reduced to completely harmless proportions. One could envisage that due to the penetration of the pores the layer impermeable to ink will begin to exhibit in the pores a structure which will be described as a number of peaks and ridges which together bound valleys or basins in which an ink is confined and can no longer migrate laterally. It is emphatically noted that this description is merely a speculative attempt to gain insight into the physical effects forming the basis of the observed improvements according to the invention.

A particular embodiment has the special feature that said material is a glue.

Such an embodiment can in very simple manner combine two functions, i.e. that of a layer impermeable to ink and that of a glue layer for adhering a printed foil to another layer.

5 A specific embodiment of the foil according to the invention has the special feature that said material is applied in liquid form and is subsequently dried or cured.

Use can for instance be made of a liquid in
10 which a solvent, for instance water, is present which is caused to evaporate. Multi-component materials can also be used which can be caused to cure. Yet another embodiment is that in which the layer impermeable to ink is arranged as a foil and is subsequently caused to
15 penetrate the porous layer by temporary increase in temperature.

A preferred embodiment which achieves to an even greater extent that the outer surface of the foil is effectively dry very rapidly, so that for instance a
20 cover foil can be glued thereto, has the special feature that on the outer side of the porous layer a cover layer is arranged for receiving ink supplied from outside.

A further increased resistance to bulging and waving is realized in an embodiment in which a carrier
25 layer is adhered to the outer side of the layer impermeable to ink.

This latter embodiment can advantageously display the feature that a glue layer is arranged on the outer side of the carrier layer. This glue layer can be
30 of the thermally-activated or pressure-sensitive type. In the latter case it will generally be necessary to make use of the protective foil which must be removed prior to the use of the glue layer.

Said porous layer can for instance consist of
35 paper or paper-like material based on natural fibres and/or synthetic fibres.

A specific embodiment has the special feature that the layer impermeable to ink is added to the porous layer by laminating or co-extrusion.

The types of ink usually applied in ink-jet
5 printers often contain additives, which can for instance act as lubricants. It is particularly these lubricants which prevent a good adhesion of the porous layer with a glue layer. This problem occurs particularly with heat-activated types of glue such as PE, EVA and the like.

10 The foil according to the prior art is found to make a long drying time of the ink necessary. If a user were to brush over the printed surface a relatively short time after the printing process, smears would then unavoidably appear on the printed surface. The foil
15 according to the invention is dry immediately after the printing process in the sense that brushing over the outer surface has no adverse effect on the print quality.

The invention will now be elucidated with reference to the annexed drawings. Herein:

20 figure 1 shows a schematic side view of a co-extrusion device for manufacturing a foil according to the invention;

figure 2 shows a partly broken-away, partly perspective view of the foil according to the invention;

25 figure 3 shows a partly broken-away perspective view of the foil according to figure 2;

figure 4 shows a view corresponding with figure 2 of a variant; and

30 figure 5 shows a view corresponding with figure 3 of the variant according to figure 4.

Figure 1 shows a co-extrusion device 1 for manufacturing a foil according to the invention consisting of a laminate. A strip of paper 3 is unwound from a roll of paper 2 by transport rollers 4. The paper
35 foil strip 3 is further transported on a conveyor belt 5. Via an extrusion device 6 a glue layer 7 is applied to the paper 3, followed by a layer of carrier material 8 which is dispensed by an extrusion device 9. Three layers

lying one on top of another thus result, which are joined together in a joining station 10, in which the joining is effected for instance by exerting some pressure.

Figure 2 shows the foil 11 leaving the joining station 10. Attention is drawn to the fact that the foil 11 is reversed relative to the configuration shown in figure 1. The porous layer of paper 3 can be printed with a pattern 12. This pattern consisting of ink is absorbed by porous paper 3 and transported downward inter alia by capillary suction.

Figure 3 shows that the paper is penetrated by the ink and also shows that glue layer 7 has also penetrated locally into paper layer 3 and has there formed a pattern such that the ink substantially cannot migrate sideways. The structures drawn are purely speculative and serve only to define the concept to some extent. It is apparent that the glue layer sealed on the underside is optionally adhered via a separate adhesive layer to the polypropylene carrier. Figure 3 further shows very schematically that glue layer 7 has as it were a one-sided porosity on the upper side: it can thus absorb ink but substantially prevents the lateral migration of ink.

Figure 4 shows an embodiment in which an ink-absorbing layer 13 is situated above the paper layer.

This latter structure in particular ensures that the ink supplied to foil 14 effectively penetrates into the porous paper layer 3.

For the sake of completeness, attention is drawn to the fact that the proportions shown in the drawing do not correspond with reality and that the different layers are not shown in the correct ratio of thickness. In addition, the spatial structure of the finished glue layer 7 is only shown on a speculative basis, without this being intended as a physical explanation in any limiting sense.

CLAIMS

1. Foil printable with ink, comprising a porous layer which is penetrable to ink and ink-retaining, for instance an open fibrous layer of paper,

characterized by

5 a layer of material impermeable to ink, which layer closes off the porous layer and has penetrated into this layer over a certain distance via the pores present therein, which layer impermeable to ink is arranged on that (inner) side of the porous layer facing away from
10 the (outer) side to which ink is supplied during a printing process.

2. Foil as claimed in claim 1, **characterized in that** said material is a glue.

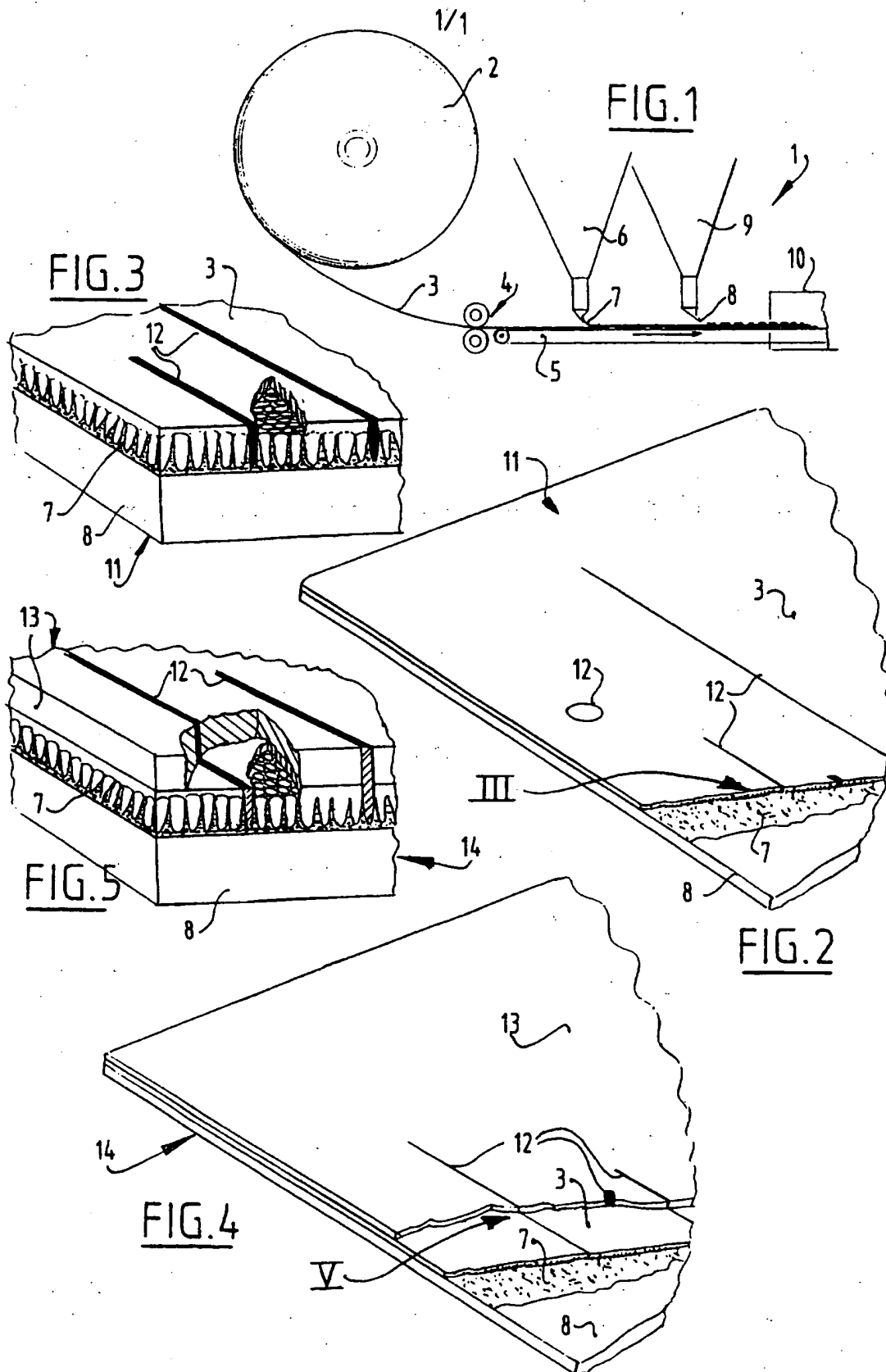
3. Foil as claimed in claim 1, **characterized in that** said material is applied in liquid form and is
15 subsequently dried or cured.

4. Foil as claimed in claim 1, **characterized in that** on the outer side of the porous layer a cover layer is arranged for receiving ink supplied from outside.

20 5. Foil as claimed in claim 1, **characterized in that** a carrier layer is adhered to the outer side of the layer impermeable to ink.

6. Foil as claimed in claim 5, **characterized in that** a glue layer is arranged on the outer side of the
25 carrier layer.

7. Foil as claimed in claim 1, **characterized in that** the layer impermeable to ink is added to the porous layer by laminating or co-extrusion.



INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER IPC 6 B41M1/36 C09J7/04 B32B29/00		International Application No PCT/NL 97/00071
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 6 B41M C09J B32B D21H		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 109 302 A (CHARS DISPLAY (LONDON) LIMITED) 2 June 1983 see page 1, line 10 - line 46 see claims 1,4,7-9; figure 1	1-3,5-7
X	US 3 802 984 A (L.D.BRUGH, JR. ET AL.) 9 April 1974 see column 3, line 10 - column 4, line 10 see figure 1	1-3,5,7
X	EP 0 551 893 A (EASTMAN KODAK COMPANY) 21 July 1993 see page 3, line 3 - line 40 see page 5, line 15 - line 20 see claims 1,2,4; examples 1-3	1-7
-/-		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.		
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Date of the actual completion of the international search 7 April 1997		Date of mailing of the international search report 12. 05. 97
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016		Authorized officer Bacon, A <i>A.S. Bacon</i>

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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